



INSTALLATION PROFILE

Heat Exchanger *Water/Sludge*

SHELAND FARMS

Adams, New York

The anaerobic digester at Sheland Farms handles manure from a herd of over 900 dairy cows. When the cows are in the parlor being milked, the alleys in the barns are scraped in to a holding pit at the end of the pen. The barns are bedded with composted solids. The cold climate of the northern part of New York presents operational challenges for the digester, which must be kept warm. Handling frozen manure is particularly problematic. The manure, which is at about 7-8% dry solids concentration following removal of gross solids, is pumped to the digester.

One vertical, insulated digester operating at a mesophilic temperature of 100 degrees F is used to produce methane from the manure. The digester has a volume of approximately 160,000 gallons. At the design manure flow of 16,000-20,000 gallons per day, this is a hydraulic retention time in the digester of 8-10 days. A mixing pump agitates the digester contents. The digested sludge is discharged from an overflow as manure is pumped to the digester. Solids are removed from a sump at the bottom of the digester.

A concentric tube, **Walker Process®** Type E hot water-to-sludge heat exchanger is located in an external sludge recirculation system that maintains the digester temperature at 100 degrees F. The exchanger has a minimum heat transfer rating of 375,000 BTU/hr. The hot water is actually a glycol/water mixture flowing at approximately 50 gallons per minute and 155 degrees F to the exchanger, while the external sludge recirculation is approximately 160 gallons per minute and 100 degrees F to the exchanger.

The digested solids are separated, dried and composted for use as animal bedding. The liquid off-flow tends to retain most of the manure's

nutrient value and can be field spread. The solids are well stabilized and have the typical odor of mesophilically-digested solids.

A propane-fired boiler can provide hot water at 155 degrees F for the hot water-to-sludge heat exchanger, to pre-heat frozen manure, and to dry digested solids in the event the digester gas production is insufficient or the generator set is off-line.

The digester gas produced, approximately 25 cubic feet per minute at the design manure flow of 16,000-20,000 gallons per day, has a heating value of approximately 600 BTU per cubic foot and is treated and fired in a Caterpillar Gas Generator Set, rated 100 KW, which converts it to electricity. The electricity produced by the generator set offsets most of the farm's consumption, and is produced in parallel with the utility so power can be exported to the grid. The generator set's heat exchanger recovers waste heat from the engine and supplies hot water for the hot water-to-sludge heat exchanger, to pre-heat frozen manure, and to dry digested solids for the production of bedding material. Any residual heat is rejected to the atmosphere through an external radiator.

Any digester gas produced in excess of that used in the generator set is wasted to a flare. This would usually occur only if the generator set was down for one reason or another.

Data for this site is collected by Siemens (www.siemens.com) and provided to CDH Energy (www.cdhenergy.com) via an sFTP connection.

http://cdhnrjy1.user.openhosting.com/Documentation/Sheland_Farms_Summary.pdf is the link to the initial data summary.

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